Analysis of stability in neutral delay differential equations through different approaches

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This work is about the analysis of equilibrium stability in certain neutral delay differential equations (ndde), which include several bifurcation parameters. In the considered cases, the associated characteristic equation is an exponential polynomial one with a principal term, so some Pontryagin results [1,2] are a convenient tool to locate its roots. Then, it is possible to set up certain regions in the parameter space where asymptotic stability can be guaranteed. Besides, the outcomes are all in agreement with those coming from a sophisticated application of the Nyquist stability criterion (based on the Cauchy's argument principle) and also with others found in the literature, related with some real systems modelled by ndde.

References

[1] Bellman R. and Cooke, K. Differential-Difference Equations, Academic Press, New York, 1963.

[2] Pontryagin, L. S. On the zeros of some elementary transcendental functions, American Math. Society Translations 21 (1), pp. 95-110, 1955.

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